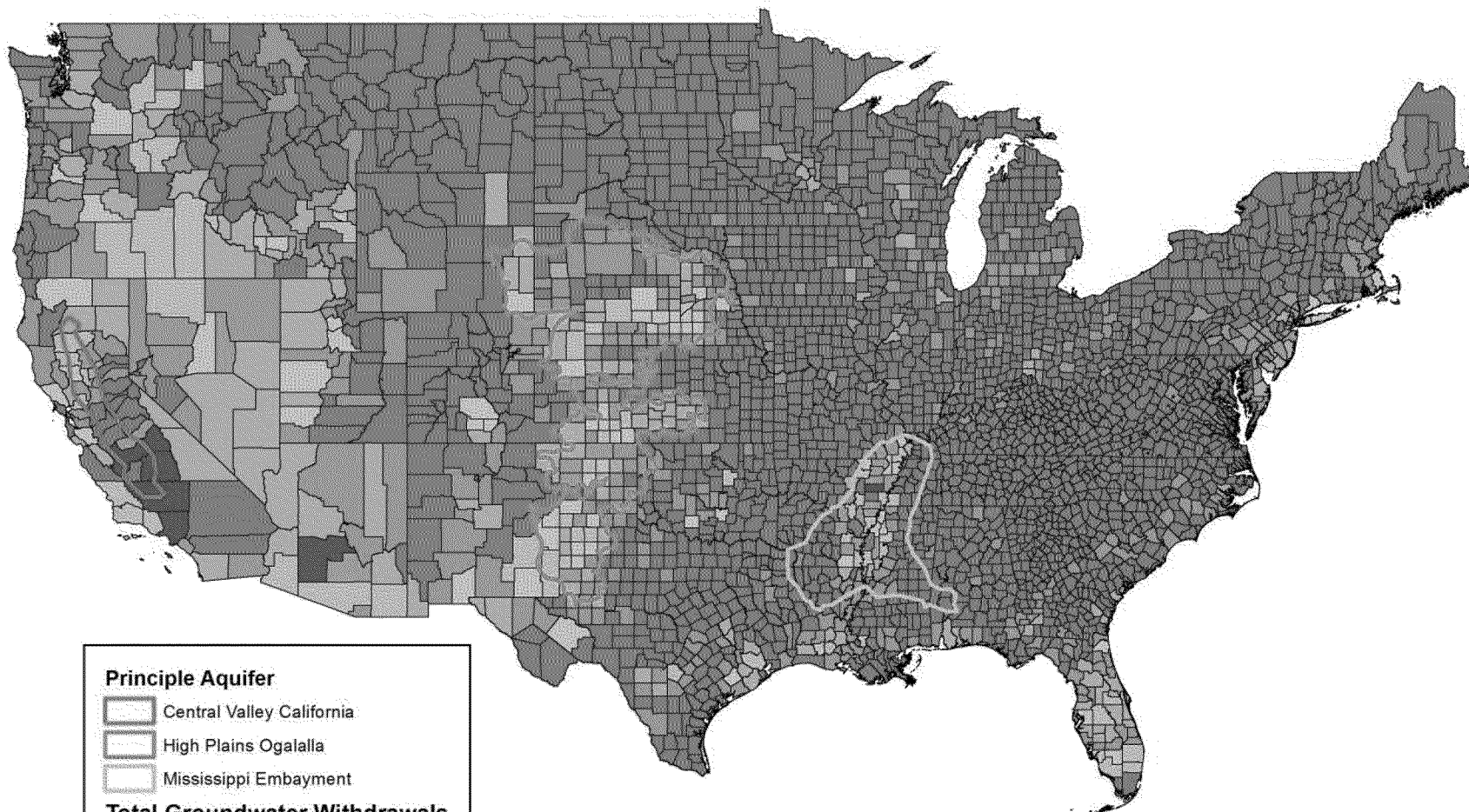





# Aquifer Exemption Petition Meeting with EPA









6/30/2016



**Principle Aquifer**

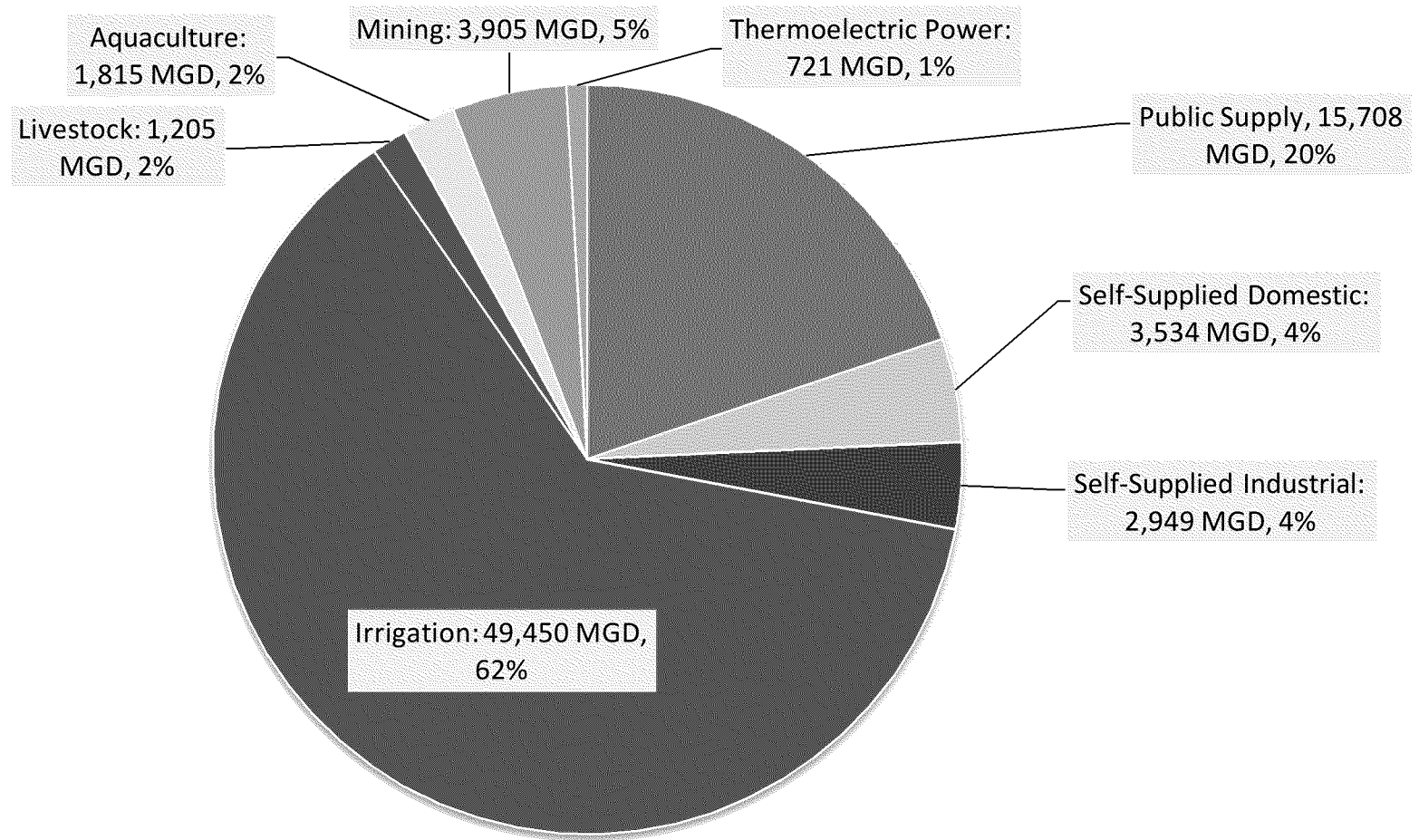
-  Central Valley California
-  High Plains Ogalalla
-  Mississippi Embayment

**Total Groundwater Withdrawals  
MGD**

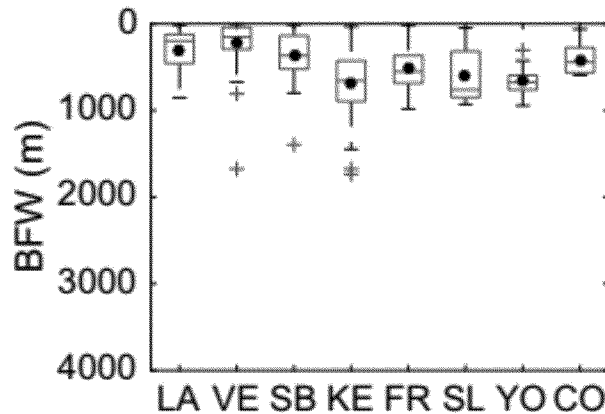
-  0 - 17
-  18 - 51
-  52 - 102
-  103 - 174
-  175 - 272
-  273 - 402
-  403 - 559
-  560 - 1,305

# Groundwater Pumping By County

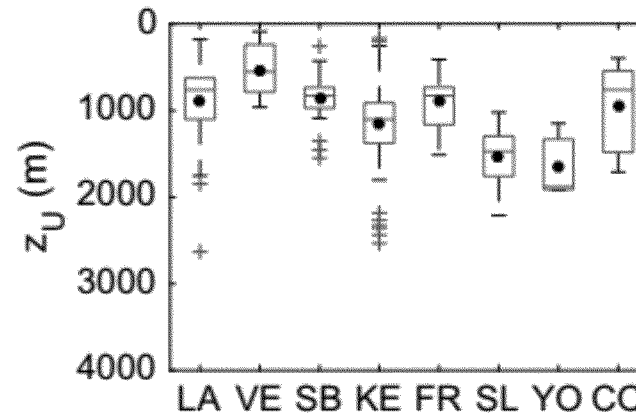
# Groundwater Pumping By Use



# USDWs occur at significant depths



Base of “Fresh Water” (< 3,000 ppm)



Base of USDWs (< 10,000 ppm)

In some cases, USDWs were observed as deep as ~7,200 feet

Los Angeles (LA), Ventura (VE), Santa Barbara (SB), Kern (KE), Fresno (FR), Solano (SL), Yolo (YO), and Colusa (CO) Counties

Mary Kang and Robert B. Jackson. **Salinity of deep groundwater in California: Water quantity, quality, and protection.** PNAS 2016 ; published ahead of print June 27, 2016, doi:10.1073/pnas.1600400113

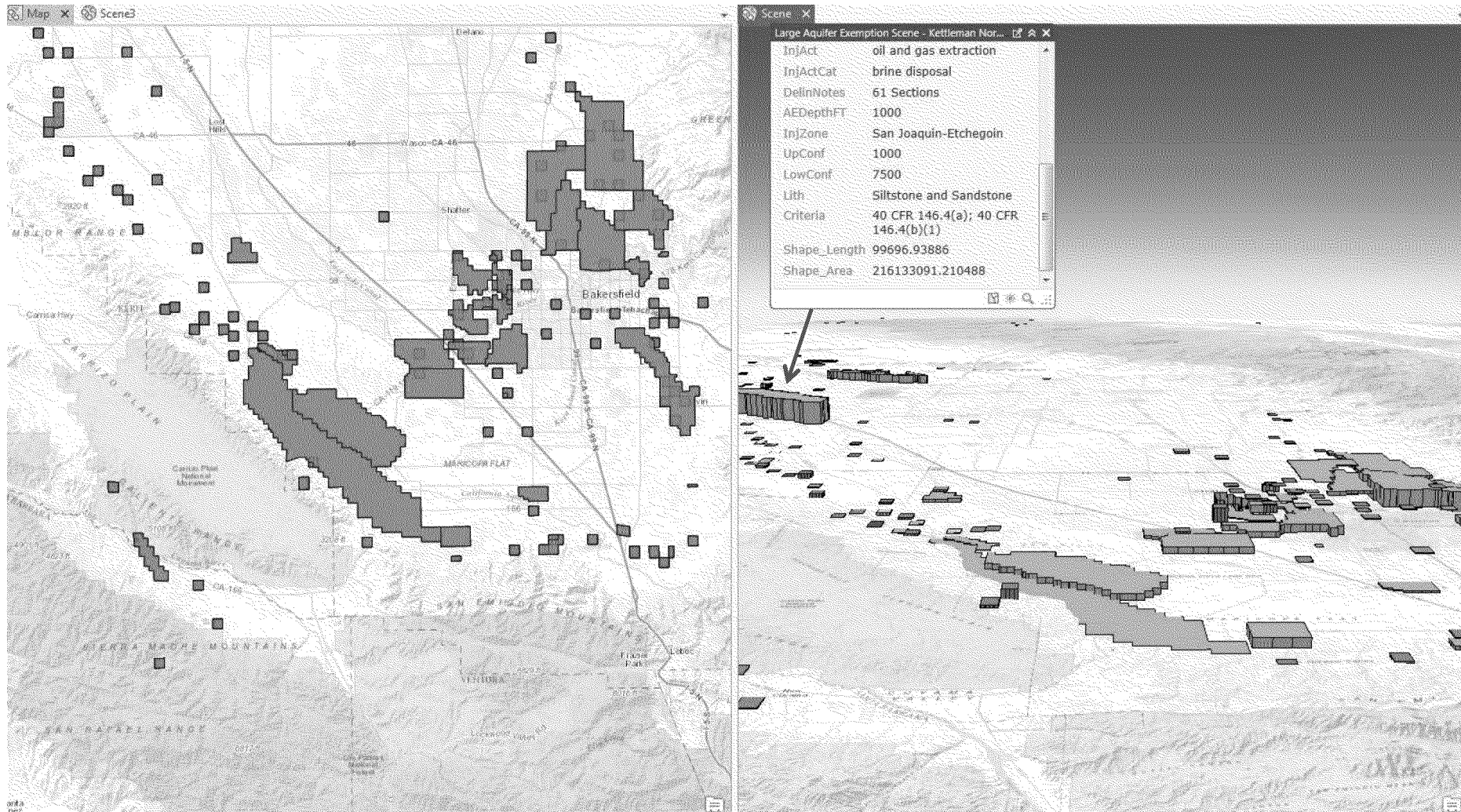
# Aquifer Exemptions by Year and Criteria

	a	A	AB	ABC	ABCD	ABCDE	ABCE	ABD	ABDE	ABE	AC	ACD	ACDE	ACE	AD	ADE	AE	B	BC	BD	BDE	C	CD	CDE	CE	E
1981																										
1982			31																							
1983	2		1140			1												300								153
1984	2	4	1														1			1						1
1985	2				1						2	1		1	1			9	1							
1986		1	5		1		2						1	1				5								
1987	1	5	5	3			1			2		1													1	
1988	4	1	5	25	1	1	2			1	1	1	1	4		1										
1989	4	1	1			7					1		4	8	4		19									
1990	1		5			1	3				12	1	1									1	1			
1991		3	3		1						9	2		6												
1992	2	3	2	1	1		1	1			1	2		1												
1993		3		1	1		1	1		1		5		1												
1994		2	9			1					1	2	5						1		1					
1995	1	1	3			1	2					1	5	3										1		
1996		1	4	1					1	13	1	1														
1997	1		6	4		2	1		1		8		5	1				1							1	
1998	1		10		3		2	1																		
1999			1				1				5	2	3	3												
2000		2	1	1		1	3					3	2													
2001		4				1	2	1			2	1	3	3			2									
2002			2	1	1	2					1	5		2	2	1		3								
2003						1					1	1	1				1									
2004			3	1		5					4	2	1	4			3									
2005			7	4		9	1				3	5		1	3		1									
2006		2	25	1		4					1	1		3			1									
2007		2	16															1								
2008			38		2	3	8			1	17		3	3		1	1									
2009		2	24			2					12	13	4			3	1	1								
2010			27		1			1		1	22	3		3			1									
2011			10	5	1						2	4	13	9	3	1										
2012			13	4							2	52		10	3	1		1								
2013			5			1					2	1		3												
NO DATE	11	3	11	1		3					6	2		2	2	1	1	5								

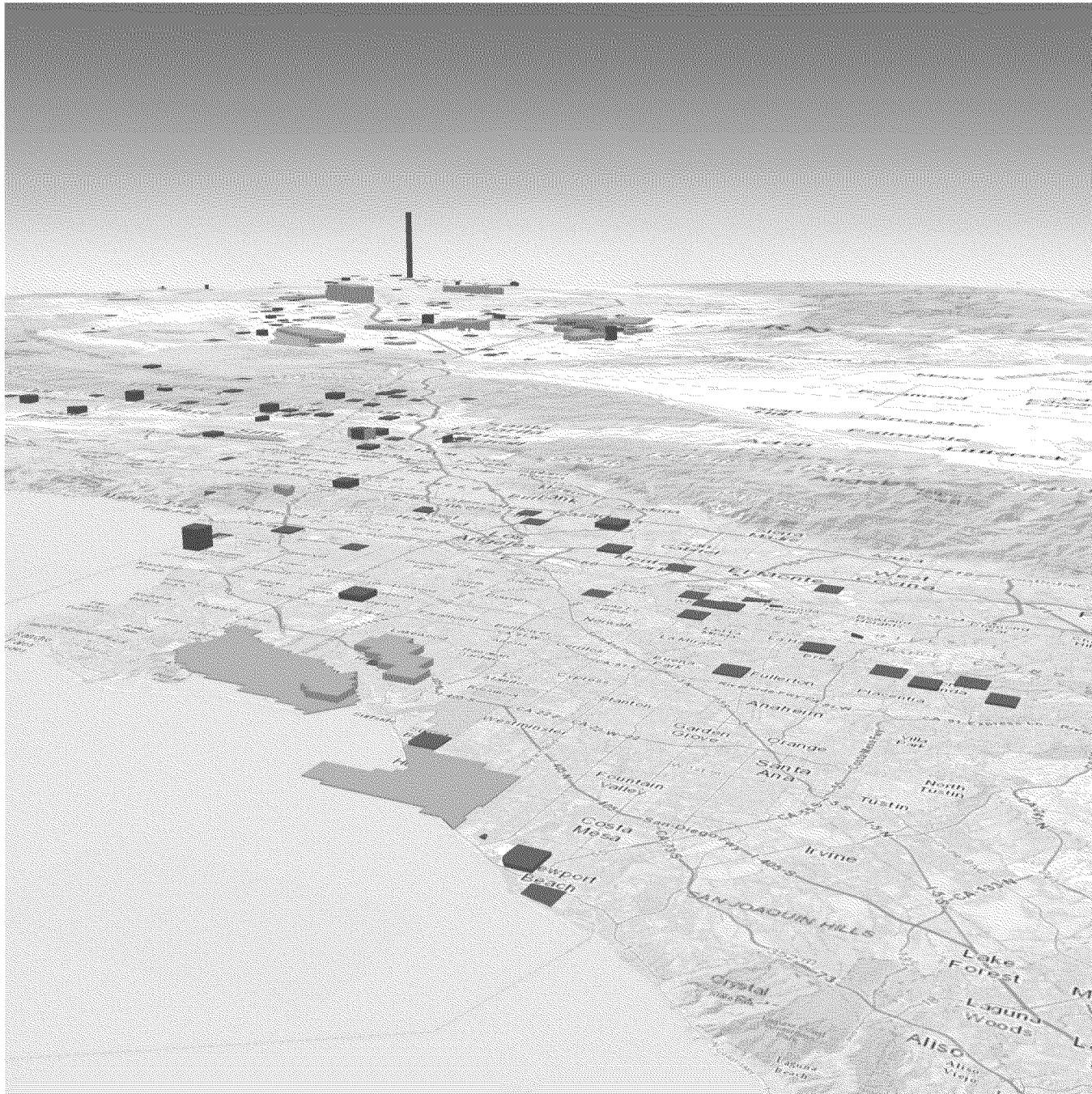
Symbol	Criteria	Description
a	40 CFR 146.4	(Unclear what criteria was used for these AE)
A	40 CFR 146.4(a)	It does not currently serve as a source of drinking water
B	40 CFR 146.4(b1)	It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.
C	40 CFR 146.4(b2)	It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical
D	40 CFR 146.4(b3)	It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption
*	40 CFR 146.4(b4)	It is located over a Class III well mining area subject to subsidence or catastrophic collapse
E	40 CFR 146.4(c)	The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/L and it is not reasonably expected to supply a public water system.

\*only 1 aquifer exemption was granted associated with 40 CFR 146.4(b4)

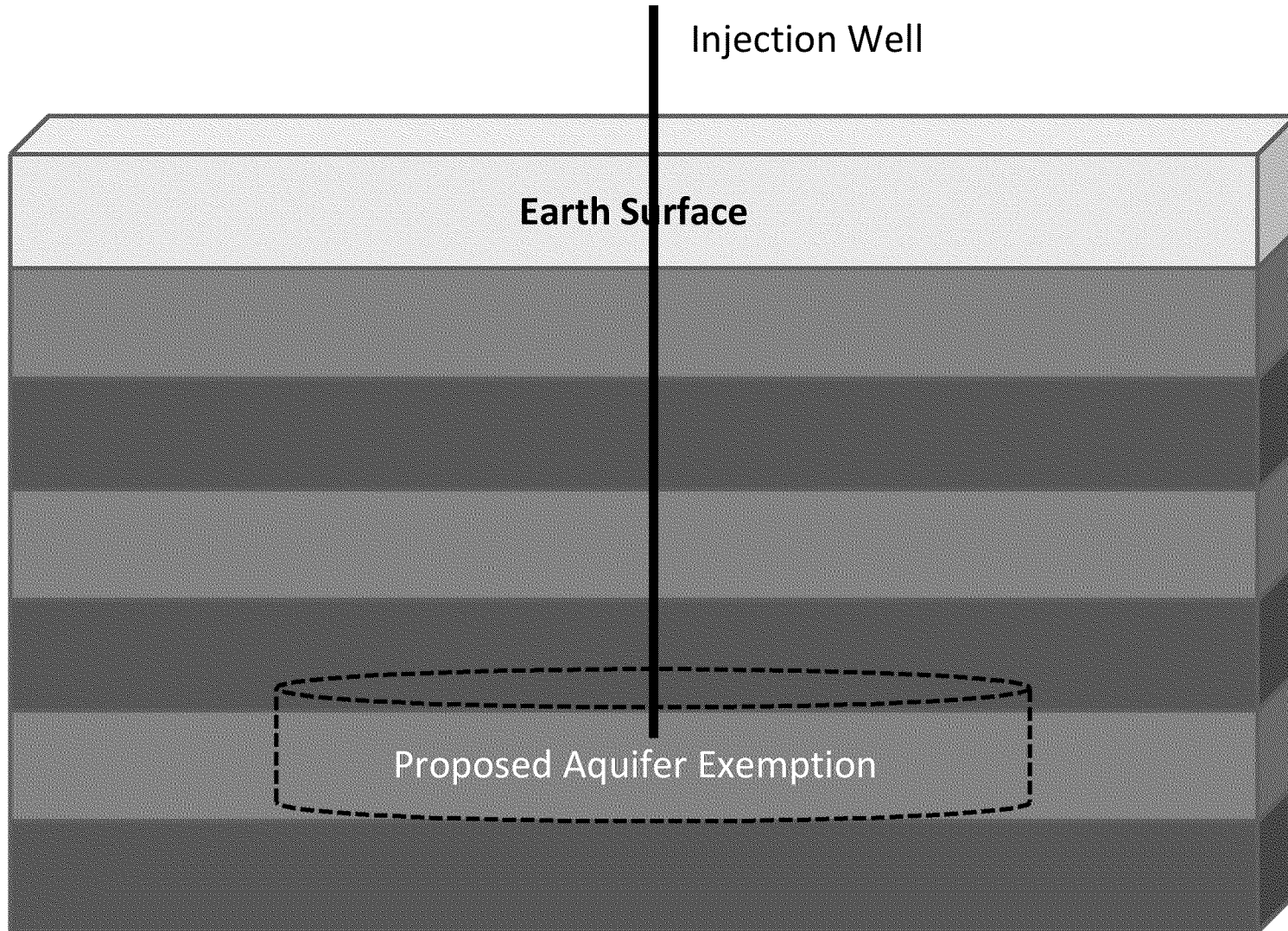
# Site Specific and Arbitrary Aquifer Boundaries



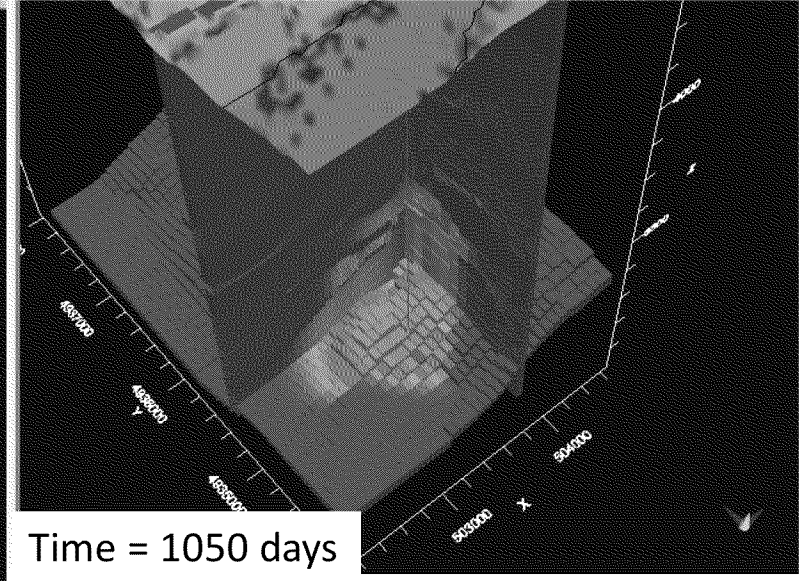
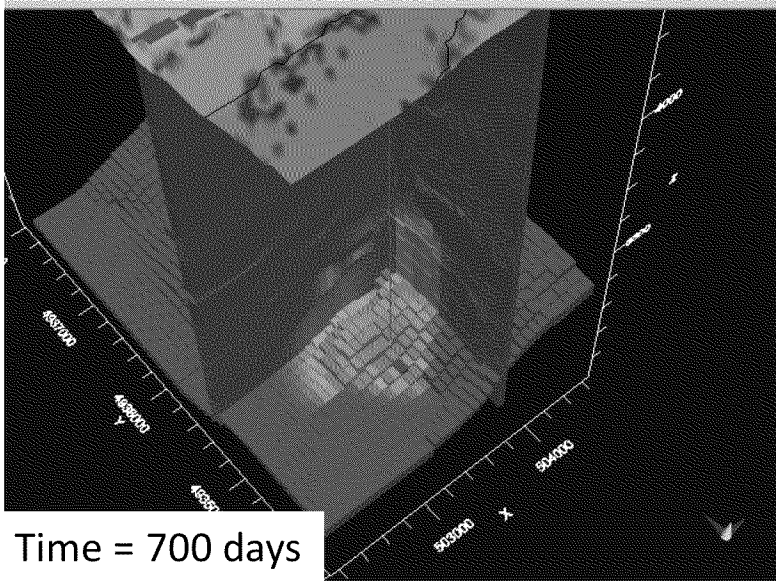
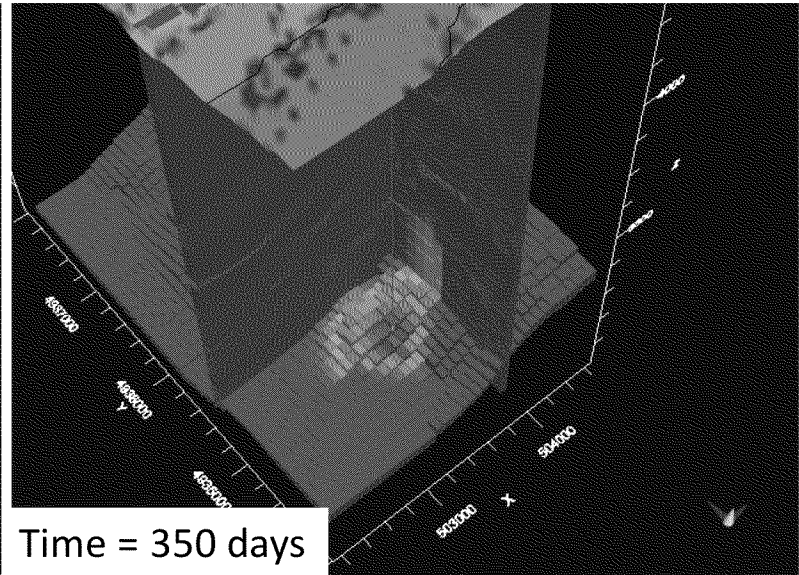
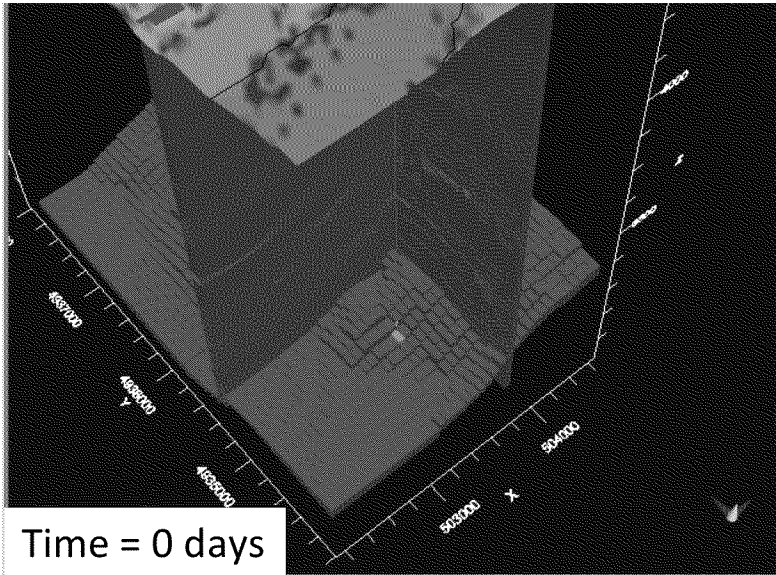




# Some Aquifer Exemptions are based on very simple assumptions – “hockey puck” or PLSS Boundary







# Impacts to USDWs from ISL uranium mining

LUBBOCK AVALANCHE-JOURNAL

## Uranium-tinged well puts family at risk

Published: Monday, August 01, 2005

ASSOCIATED PRESS

RICARDO (AP) - The extended Garcia family has lived for five generations in a cluster of frame and trailer homes known, with some irony, as Garcia Hill because its compound sits maybe a foot higher than the surrounding scrub.

The Garcias have another local distinction: Their water is contaminated with uranium at levels so high the U.S. Environmental Protection Administration has told them to stop drinking it and see their doctors because of a high risk of cancer.

The government and the company that has been mining uranium in the area for the last 20 years told the Garcias the contamination is natural seepage from the vein of the radioactive material that runs near their well, the very uranium that attracted Lewisville-based Uranium Resources Inc. to Kleberg County in the first place.

The Garcias and other Kleberg County residents don't accept that explanation.

"That's weird that it's the only place and nobody else has it," Humberto Garcia said. "It just kind of raises questions. A quarter mile away we have relatives, and their well is OK."

The Garcias and other local residents see the family's plight as an emblem of the problems they say URI has dumped on them for decades.

URI well casings stick out of the ground on Garcia Hill. In the 1980s and early 1990s, URI pumps sucked uranium-filled water from deep underground for processing.

The activity ended when prices plummeted from more than \$30 a pound to around \$7. Claiming financial problems, the company left without cleaning up the area or restoring the water below.

"The promise was they would take all the uranium and leave the water clean," said Teo Saenz, president of STOP (South Texas Opposes Pollution). "They didn't."

STOP members, who number about a dozen, say an engineer mapped the underground for them in the mid-1990s and accurately predicted that contamination from the mine field would migrate first to the Garcia wells. They now fear poisoned water will seep toward the water supply of nearby Kingsville, population 26,000.

The county reached a settlement in December with URI to clean the water. Under the agreement, the company must clean up its

**“This is the first time that contaminants in an off-site domestic well have been linked to ISL uranium mining in the United States of America.”**

**- George Rice, Hydrologist.**  
*Excursions of Mining Solution at the Kingsville Dome In-situ Leach Uranium Mine*

<http://static1.squarespace.com/static/56e481e827d4bdfdac7fb0f/t/56f87e264c2f85720ce5e512/1459125809672/Rice%2C+2013%2C+Excursions+of+mine+solution+at+the+kingsville+dome+in-situ+leach+uranium+mine.pdf>

[http://lubbockonline.com/stories/080105/nat\\_080105032.shtml#.V3QoXvkrKUm](http://lubbockonline.com/stories/080105/nat_080105032.shtml#.V3QoXvkrKUm)

# Impacts to Vertical Aquifers from ISL Activities

## Environmental Impacts of In-situ Leach Uranium Recovery: Smith Ranch - Highland ISL

In-situ leach uranium recovery (ISL) has become the predominant uranium extraction method in the United States. However, no ISL uranium mine has demonstrated the ability return uranium concentrations to baseline with significant efforts at aquifer restoration. Currently, the EPA's MCL for Uranium in drinking water is 0.03 mg/L and concentrations in drinking water above the MCL are hazardous to human health. Note: Make sure to see the range of uranium concentrations.

Baseline Uranium C...

Post-Restoration Ur...

Uranium Contamina...

Selenium Contamin...

### Uranium Contamination in Shallow Groundwater Aquifers

Dozens of malfunctioning production and injection wells have been observed in wellfields C, E, and F at Smith Highland. The result is elevated concentrations of Uranium in shallow (near the surface, <200 feet deep) aquifers that are not exempted by the EPA. The EPA's safe drinking water standard for Uranium is 30 ppb.

ADAMS Accession Number: ML13109A315



<http://isl-uranium-recovery-impacts-nrdc.org/Smith-Highland/>

# Vertical Confinement Issues



NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

May 18, 2016

Mr. John Cash, Vice President  
Lost Creek In-Situ Recovery, LLC.  
5880 Enterprise Drive, Suite 200  
Casper, WY 82609

SUBJECT: DEFICIENCIES IN LICENSE AMENDMENT APPLICATION, LOST CREEK  
IN-SITU RECOVERY PROJECT, SWEETWATER COUNTY, WYOMING,  
LICENSE NO. SUA-1598, DOCKET NO. 040-09068

Dear Mr. Cash:

On April 15, 2015, the U.S. Nuclear Regulatory Commission (NRC) notified Lost Creek In-Situ Recovery, LLC. (LCI) that the staff had identified technical deficiencies in the KM Horizon and Lost Creek East license amendment requests and had terminated its acceptance review (NRC's Agencywide Documents Access and Management System (ADAMS) Accession No. ML15093A261). For both amendment requests, the deficiencies identified were related to the characterization and performance of the confining unit (K shale) that separates the KM horizon production zone from the underlying aquifer (L horizon).

As a follow-up to the April 2015 letter, the staff contacted you by phone to underscore the importance of demonstrating that production fluids can be contained within the production zone and that characterization of confining units was essential to that demonstration. Additionally, staff shared information on how a similar issue was addressed at a different site. LCI stated that it understood the staff's concerns and indicated it was planning several potential actions to address these issues including conducting additional drilling, aquifer testing, and hydrologic modeling.

On February 10, 2016, LCI submitted revisions to the Lost Creek KM Horizon and Lost Creek East amendment requests to address the NRC's previously identified deficiencies (ADAMS Accession No. ML16056A543). The primary revision to the amendment requests is the addition of Attachment D6-5 to Volume 8 which presents the results from site-specific groundwater modeling analyses based on existing data (no new site characterization data were submitted). LCI stated that the focus of the groundwater modeling analyses was to demonstrate hydraulic control, both horizontally and vertically of production and restoration fluids.

On March 7, 2016, the NRC initiated an acceptance review of the revised amendment requests (ADAMS Accession Nos. ML15044A173 and ML16056A543). During the acceptance review, deficiencies were identified that prevent the NRC from accepting the application for detailed technical review. These deficiencies include incomplete characterization of the confining unit that underlies the KM horizon and an inadequate demonstration that KM horizon production fluids can be contained within the production zone. The vertical confinement or hydraulic isolation between the ore production zone and upper and lower aquifers is essential to safely conducting in situ recovery operations. Section 2.7.1 of NUREG-1569 reflects this position and indicates that, the characterization of the site hydrology must be sufficient to establish the

**Aquifer Exemption  
Approved by EPA under  
146.4(a) and 146.4(b1)  
(WDEQ – 8/23/2011)**

**- No consideration or  
analysis of the geological  
confinement**

ML16106A019

# Petitioner 'Asks'

- Update criteria for determining fluid migration pathways, modeling, and monitoring
- Updated criteria to prove adequate vertical confinement
- Updated sampling protocols to determine groundwater TDS: assumptions about deep = poor groundwater quality are too simplistic
- Sample QA/QC for determining water quality. Several current acceptable techniques were not designed for measuring water quality, such as resistivity logs.
- Update the requirements for water quality parameters beyond only using TDS.
- Updated criteria to account for climate change and future water demands.